Oroville Facilities Relicensing
(FERC Project No. 2100)
Engineering and Operations Work Group
Preliminary Issue Sheet

Issue Statement E1

Evaluate the potential for adding additional generation using existing infrastructure, modifying facilities to increase storage and associated generation, and changing operation to provide spinning reserve (e.g., motoring) (Issues addressed: EE 1, 2, and 14).

Resource Goals

- Maximize the benefits from electrical power generation and ancillary services within other operational constraints.
- Add additional power generation capacity if economically feasible.

Scope

Within FERC Project 2100 Boundary

Existing Information:

1. Existing facility data – The existing information, such as as-built drawings, operation manuals, maintenance records, etc. about the current water and electrical facility at the Oroville-Thermalito complex.

2. Existing Operation data – The records of historical water and power operations at the Oroville-Thermalito complex, including the reservoir storage, flow at each Powerplant, and the actual power produced.

3. State of California studies currently underway for additional generating capacity within Oroville FERC project boundary.

4. 1997 Hyatt Powerplant Modernization study.

5. 1987 Hyatt Powerplant Flood Operations study.

6. 1985 Thermalito Diversion Dam Powerplant study.

7. Studies performed in the early 1980's for additional generation capacity at various SWP facilities.

Information Needed:

1. The existing data and modeling information needs to be compiled and analyzed to identify potential ways to increase electrical generation benefits.

2. Detailed estimates of electrical power and ancillary service production under the different combinations of infrastructure, physical enhancements, and operations policy that could improve electrical generation benefits.

3. Electrical power market information on demands and prices required for economic evaluation of electrical generation alternatives.

Level of Analysis

- Electric power generation benefits are affected by various factors including the time of day the power is generated, environmental constraints, and hydrology, etc. To account for the time of day variance in the values of electric power generation, the electric power analysis on an hourly basis would be needed. This would require detailed computer model simulations of the various alternatives under consideration.

- Reconnaissance level study of alternatives for generation capacity increases.

Issues Addressed:

EE1. Consider adding additional generating capabilities (some existing infrastructure).

EE2. Intake on North side of dam - Afterbay outlet motoring to provide spinning reserve.

EE14. Potential physical changes to facility to increase storage and generation. Impacts to existing and potential facilities.

Oroville Facilities Relicensing
(FERC Project No. 2100)
Engineering and Operations Work Group
Preliminary Issue Sheet

Issue Statement E3

Evaluate potential for improved coordinated operation of Oroville Facilities through additional coordination with other water storage facilities and regulatory and resource agencies (e.g. CALFED).

Resource Goals:
Evaluate the potential for the California Department of Water Resources to coordinate the operation of the Oroville Facilities with the following organizations

United States Bureau of Reclamation
United States Army Corps of Engineers
Pacific Gas and Electric Company
Yuba County Water Agency
United States National Marine Fisheries Service
United States Fish and Wildlife Service
California Department of Fish and Game
Independent System Operator

Minimize straying of hatchery salmon through coordinated dam releases
Reduce flood and drought impacts through coordinated dam releases
Minimize adverse impacts to water supply and power generation required to meet downstream water quality requirements
Avoid power curtailments

Scope:
The Feather River basin from Oroville Dam to the point of no significant impact

Existing Information:
Current ~~C~~coordination ~~A~~activities and agreements

Flood Control

DWR's Flood Operations Center coordinates the releases from the major reservoirs throughout the state of California to minimize flooding. This coordination involves the operations of the Oroville complex by ~~the~~ DWR, Bullards Bar by YCWA, and the Shasta and Folsom complexes by the USBR. This coordination often involves consultation with the USACE.

Hatchery Operations

DWR coordinates with DFG to meet the varying needs of the Feather River Fish Hatchery.

Sacramento-San Joaquin Comprehensive Study
USF&WS and DFG salmon studies related to point of origin (coded wire tag data)
CDEC (dam release, river flow, etc.)
DWR Dry-Year Contingency Report to the Governor (find our correct name of report)

Information Needed:

Correlate salmon studies and CDEC information (river flow data)
Develop wetness parameter to be more responsive to drought and flood conditions to maximize storage in the reservoir

Level of Analysis

Desk top study using existing information

Issues Addressed

EE5. Coordination with releases from other water storage facilities? - for fisheries protection CVP facilities preventing straying of salmon and steelhead.

EE6. Coordination and evaluation of DF & G, USFWS and other regulatory agencies release requirements to better fit with reality. High agency level decision.

Oroville Facilities Relicensing
(FERC Project No. 2100)
Engineering and Operations Work Group
Preliminary Issue Sheet

Issue Statement E7

Effect of the project including discharge (magnitude, frequency and timing) and ramping rates and the altered stream hydrology on substrate scour, mobilization of sediments, turbidity levels, and riparian vegetation in the low flow reach and downstream of the Afterbay

Resource Goals:
~~Evaluate effects on sediment transport and riparian vegetation.~~
Enhance and maintain natural geomorphic processes to the extent feasible
Maintain economic benefits of gravel mining operations
Maintain ability to operate Oroville Facilities in a safe, efficient and economic manner
Enhance and maintain riparian habitat and water quality

Scope ~~of Work:~~
Feather River low flow reach *from the Fish Barrier Dam downstream to the Thermalito Afterbay river outlet structure,* ~~-~~and downstream of the Thermalito Afterbay river outlet *structure to the ~~southern boundary of the Wildlife Area~~confluence of the Yuba River.*

Existing Information:
River flow and stage data
River temperature data
Flood release records
Reservoir turbidity records.
Ramping criteria
Aerial photographs
Oroville reservoir sedimentation studies
(See G-1)

Information Needed:
Sediment transport analysis
Riparian vegetation survey analysis
Current aerial photographs
Release data (15-minute, 60-minute, average daily)

Level of Analysis:

Oroville Facilities Relicensing
(FERC Project No. 2100)
Engineering and Operations Work Group
Preliminary Issue Sheet

Issue Statement E10

Effect of future water demands on project operations including power generation, lake levels and downstream flows. Consider sale of existing water allotments to downstream users

Resource Goals:
Evaluate effects of future water demands on project operations.

Scope of Work:
Determine projected population growth in California for the next 30 years and resulting water demands. What portion of future water demands to be provided by the SWP, and more specifically Oroville. Given this information, the effect on project operations can be better evaluated.

Existing Information:
Water Supply Forecasts
Current water allotments/contracts
Downstream water quality demands
Downstream fisheries demands

Information Needed:
Future population estimates/ water demands
Future environmental demands

Level of Analysis:
This study would rely on demographic projections to predict future water demands. Concurrent studies in the Environmental Work Group may provide information on future fisheries demands as well as Delta water quality requirements.

Issues Addressed
EE 18. What are 50-year projections for water/power demands and plans to meet those needs and impacts of meeting demands? (context of existing full allocations)

EE20. Sale of existing water allotments to downstream users

Oroville Facilities Relicensing
(FERC Project No. 2100)
Engineering and Operations Work Group
Preliminary Issue Sheet

Issue Statement E11

Effect of tires in Parrish Cove and Bidwell Cove and stakes used to hold down recycled Christmas trees on public safety

Resource Goals:
To remove all safety hazards regarding stakes and tires in Parrish and Bidwell Coves.

Scope of Work:
Parrish Cove and Bidwell Cove of Lake Oroville.

Existing Information:
There are stakes and tires posing a boating and wading hazard in Bidwell and Parrish Coves. The tires also cause mosquito concerns.

Information Needed:
Identification and contact information of the party or programs that installed the stakes and tires.

The manpower, tools, and transportation needed to remove the hazards.

Level of Analysis:
A crew of field staff to travel by boat or truck and assess the area. Remove stakes, tires, and any other introduced hazard in the area. Identify programs that implemented the installation of the stakes and tires and petition for their termination or modification to address the above issue.

Issues Addressed
EE54. Effect of tires in Parrish Cove and Bidwell Cove (mosquito abatement).

EE55. Effects of stakes used to hold down recycled Christmas trees on public safety

This study would rely on historic reservoir operational and flood release data as well as comparing "before " and "after" aerial photography. The reservoir sedimentation study and historic turbidity records could help predict sediment pass through.

Issues Addressed:

EE29. Project features and operations alter the hydrology of the system, creating the possibility for scour zones within both natural and designed channels. What affects do discharge and ramping rates have on substrate scour and the mobilization of sediments into the water column downstream? How have turbidity levels been affected by project operation?

EE30. Alterations in stream hydrology affect the natural fluvial geomorphologic processes of a riverine system. How has the change in magnitude, frequency and timing of peak flows on the Feather River affected riparian vegetation recruitment in the low-flow reach and immediately downstream of the Afterbay?

EE36. Direct, indirect and cumulative impacts of project facilities and operations on sediment movement and deposition, river geometry, and channel characteristics. This includes impacts on stream competence, capacity, bank stability and extent, duration, and repetition of high flow events.

EE41. Direct, indirect and cumulative impacts of project facilities and operations on sediment movement and deposition, river geometry, and channel characteristics. This includes impacts on stream competence, capacity, bank stability and extent, duration, and repetition of high flow events.

EE42. Bedload transport, current condition of habitat potentially impacted by project and alternatives to conserve or enhance

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

G1. Effects of Project Operations on Geomorphic Processes

Issue Statement: Effects of existing and future project operations on natural geomorphic processes. These include physical attributes and functions (e.g. channel morphology, channel stability, sediment transport and deposition, spawning gravel, large woody debris recruitment, habitat diversity) and subsequent effects on biological resources (e.g., aquatic macro-invertebrates and riparian vegetation) in the low-flow section and the Feather River downstream of Thermalito Afterbay under wet and dry year criteria.

Resource Goals:
• Operate project facilities to minimize adverse project impacts to the extent feasible on natural geomorphic processes in the downstream reaches.
• Maintain and enhance or increase aquatic and terrestrial habitat.

Scope: In the Feather River downstream of the Fish Barrier Dam to the confluence with the Yuba River.

Existing Information:

- "Feather River Spawning Gravel Baseline Study", published by the Department of Water Resources-Northern District, 1982 provides information on sediment transport, spawning gravel quality, enhancement opportunities and hydrology. The report defines spawning gravel goals and criteria and the effect of the dam on downstream sediment resources. Several updates of gravel size distribution have also been published.

- The report "Use of Alternative Gravel Sources for Fishery Restoration and Riparian Habitat Enhancement, Shasta and Tehama Counties, California" prepared for DFG by DWR-ND provides information on conducting spawning gravel rehabilitation activities.

- Watershed conditions, including erosion, landsliding, and sediment production from the North, Middle, and South forks of the Feather River upstream from Lake Oroville were estimated in a Department of Water Resources-Northern District memorandum dated 1994. Is this reference relevant to downstream conditions? My sense is the sediment production may be relevant because it has been cut off. If this is the case we might not need the next reference. Alternatively, if the sediment losses are provided through the next reference, then we may not need this one.

- Lake Oroville sedimentation was measured using lake transects by DWR_ND. Results were reported in the " 1993-1994 Lake Oroville Siltation Study". The report

provided information on the sediment production of the upstream watersheds, information required to estimate sediment losses to the downstream ecosystem.

- Feather River downstream from Oroville Dam is monitored continuously at a number of gaging stations, providing hydrologic date necessary to estimate pre- and post dam hydraulic changes. The data are available from the California Data Exchange Center.

- The U.S. Geological Survey published "Sediment Transport in the Feather River, Lake Oroville to Yuba City, California" provides information prior to 1967 on sediment transport, hydrology, hydraulic geometry, and other channel characteristics. This report will be useful in determining changes between the completion of Lake Oroville and the present.

- Feather River IFIM Study by DWR, 1994

Information Needed:

1. Physical Data- Bank erosion locations, historic channel changes, historic photographs, cross-sections, and old survey maps showing pre- and post dam conditions, including channel width, cross-sectional area, vegetation, channel roughness, gradient, depth, flow, velocity, bankfull discharge, and riverbed material (cobble, sand, silt, etc), ~~and etc. Also~~ Also need historic spawning gravel data. New surveys of the channel thalweg and~~,~~ cross-~~sections,~~sections ~~and etc.~~ will be done and compared to the historic data.

2. Develop Process Rates- Develop geomorphic process rates for bank erosion, sedimentation, sediment routing, spawning gravel and bedload movement under different flow conditions???.

3. Perform analysis of project impacts on river geomorphology. Can we be a little more specific on this one?

4. Evaluate effect of project on habitat suitability and riparian vegetation resources.

Level of Analysis:

Conduct ~~field work~~fieldwork to include measurements of bank erosion, sediment transport, and other monitoring activities throughout the year and under different hydrologic conditions as they occur during the study period in project waters.

Perform a literature review of the existin~~e~~g historic data of channel loca~~a~~tions, cross-sections, sediment transport and flow parameters to develop the pre project conditions.

Analyze and compare the pre and post-project conditions to establish the project related impacts. Will we use a sediment transport model?

Can we say something about woody debris? This was raised by the NGOs.

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

G2. Project Effects on Channel Capacity and Storage for Flood Protection

Issue Statement: Project effects on channel capacity and potential need for more storage for flood protection.

Resource Goals:

- Operate the project in a manner to maintain design capacity and reduce the risk of flooding
- Maintain and enhance channel and floodway capacity.
- Maintain and enhance flood routing characteristics to maintain or reduce the risk of flooding.

Scope: Within the FERC project boundary downstream of the Fish Barrier Dam to the confluence with the Yuba River.

Existing Information:

1. Feather River downstream from Oroville Dam is monitored continuously at a number of gaging stations, providing hydrologic date necessary to estimate pre- and post dam hydraulic changes. The data are available from the California Data Exchange Center.

2. "Feather River Spawning Gravel Baseline Study", published by the Department of Water Resources-Northern District, 1982 provides information on sediment movement, channel roughness and channel degradation.

3. Watershed conditions, including erosion, landsliding, and sediment production from the North, Middle, and South forks of the Feather River upstream from Lake Oroville were estimated in a Department of Water Resources-Northern District memorandum dated 1994.

4. Lake Oroville sedimentation was measured using lake transects by DWR-ND. Results were reported in the " 1993-1994 Lake Oroville Siltation Study". The report provided information on the sediment production of the upstream watersheds, information required to estimate sediment losses to the downstream ecosystem.

5. The U.S. Geological Survey published "Sediment Transport in the Feather River, Lake Oroville to Yuba City, California" provides information prior to 1967 on sediment transport, hydrology, hydraulic geometry, flood control levees, and other channel characteristics. This report will be useful in determining changes in channel capacity between the completion of Lake Oroville and the present

6. The results of the US Army Corps of Engineers' comprehensive flood control study for the Central Valley, and existing Corps and DWR flood management data.

Information Needed:

1. Survey Data- new surveys, including river cross-sections and thalweg profiles.

2. Topographic maps (2-foot contours recommended), geologic maps, meander belt, geologic channel control.

3. Analyze the effects of existing and future project operations on storage, and flood protection in the low-flow section and the Feather River downstream of Thermalito Afterbay under wet and dry conditions. These include channel attributes and functions such as channel capacity, morphology, stability, sediment transport, deposition, and water levels for various flow conditions.

Level of Analysis:

Perform literature review of existing information on channel changes, cross-sections, and old survey maps showing pre- and post dam conditions, including channel width, cross-sectional area, vegetation, channel roughness, gradient, depth, and etc.

Conduct fieldwork as required to acquire new cross-section surveys to compare with historic cross-sections.

These existing and new data will be used to evaluate changes in channel capacity and storage within the reservoir.

The FERC relicensing analysis will focus on determining the impact of Oroville's effect on channel capacity. DWR will continue to work with the Corps though its existing comprehensive flood control study to determine the need for additional storage for flood protection.

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

G3. Coordinating Long-Range Watershed planning activities with Local, State, Federal Agencies and Local Landowners

Issue Statement: The need to coordinate long-range watershed planning activities with local, state, and federal agencies and private landowners.

Resource Goals:
- Minimize adverse project impacts on coordination of long-range watershed planning.
- Maintain and improve long-range watershed planning.

Scope: Within the FERC project boundary upstream of Lake Oroville and within the flood plain of the Feather River downstream to the Yuba River.

Existing Information:

- U.S. Forest Service Environmental Impact Statement for forested areas in the watershed, specifically the Plumas National Forest, provide information on goals and criteria. The Service has also published reports on its Watershed Improvement Program, Management Program, Riparian Initiative Assessment Reports, Land and Resource Management Plans, Cumulative Watershed Effects Reports, Stream Classification and Channel Condition Surveys, Sediment Source Inventories, and Watershed Plans. These data provide background data for the coordination efforts between the stakeholders.

- Memorandum of agreement between various parties for regional erosion control plan for the east Branch North Fork Feather River watershed now including the Middle Fork Feather River.

- Pacific Gas and Electric, Hydro Power Benefits of Cooperative Watershed Management.

Information Needed:

1. Coordinate with the Feather River Coordinated Resource Management Group to provide a forum for discussing issues

2. Perform an analysis of project impacts on Watershed Coordination.

Level of Analysis:

Conduct a literature review of all management coordination activities currently underway within the watershed.